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NOTES ON THE LARVAE OF *MONILIFORMIS*
MONILIFORMIS (BREMS.) FOUND IN
AFRICAN COCKROACHES

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The material on which these notes are based consisted of about 30 cysts which were collected by Dr. J. W. S. Macfie of Accra, Gold Coast, West Africa, from the abdominal cavities of 2 cockroaches (*Periplaneta americana*). Among these cysts were found 8 or 9 gravid female specimens of *Oxyuris blattae-orientalis* Hammersch., 1847, recognized by the esophagus possessing a lateral pouch.

Travassos (1917) splits up the family *Gigantorhynchidae*, Hamann, 1892, into 2 sub-families, viz., *Gigantorhynchinae*, Travassos, 1915, and *Prosthenorchinae*, Travassos, 1915. The sub-family *Gigantorhynchinae* contains 5 genera, 1 of which is *Moniliformis*, characterized by the possession of numerous small hooks. There are 2 species in the genus, viz., *M. moniliformis* and *M. cestodiformis* (v. Linstow, 1904)

MONILIFORMIS MONILIFORMIS (BREMS.) TRAVASSOS, 1915

Syn.—*Echinorhynchus moniliformis* Bremser, 1819

Gigantorhynchus moniliformis (Brems.) Railliet, 1893

Echinorhynchus grassii Railliet, 1893

The adult form of *M. moniliformis* has been recorded from the following hosts: *Man*, *Sciurus niger*, *Eliomys quercinus*, *Cricetus cricetus*, *Mus rattus*, *Mus norvegicus*, *Mus albipes*, *Microtus arvalis*, *Canis familiaris*, *Lepus sinditicus* and *Erinaceus algirus*. The larva occurs in *Periplaneta americana* and *Blaps mucronata*. It has also been recorded from *Putorius putorius* and *Circus pygargus*, but it is extremely rare in the 2 latter hosts. Both the larva and the adult are of world wide distribution.

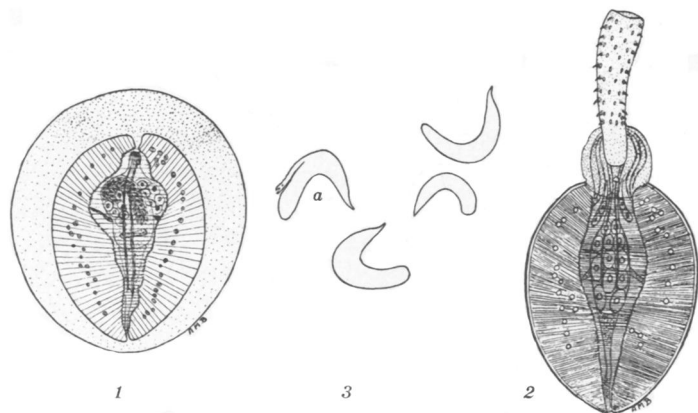
The larva found in the cockroach is enclosed in an extremely delicate cyst which is easily lost. In shape it is globular; its diameter varies from 0.9 to 1.2 mm. In young larval forms it is partly filled with granular material which gradually disappears as the larva becomes older (Text fig. 1).

The larva lies within the cyst wall and is milky white in appearance. In shape it resembles a split pea, except that it is more heart-shaped, and has one surface slightly concave whilst the other (convex) surface has, in addition, a broad ridge running across it antero-posteriorly. The size of 7 of these larvae varied as follows:

No.	Length, micra	Breadth, micra
1	800	580
2	910	740
3	984	750
4	1060	760
5	1060	800
6	1100	770
7	1120	810

On microscopic examination the larval body-wall presents a striated appearance, and a number of giant nuclei lie in small annular lacunae placed centrally in the body wall (Text figs. 1 and 2). The body cavity in which the rudiments of the reproductive system lie narrows behind and opens to the exterior posteriorly.

The proboscis was extruded in one specimen only, and in this case its total length was 620 μ and its breadth 155 μ . The posterior third of



Text figures. *Moniliformis moniliformis*, larva. 1, Cyst from cockroach, $\times 35$. 2, Larva from cyst, $\times 35$. 3, Hooks from proboscis of larva; a, hook with rough posterior end; \times about 300.

the proboscis (200 μ in length) was unarmed, the anterior two thirds (400 μ in length) being armed. There are about 12 longitudinal rows of hooks and about 6 or 7 hooks in each transverse row. The hooks near the anterior extremity are much larger than the posterior hooks and there is considerable variation in the shape of both types (Text fig. 3). They are all roughly semicircular, having one extremity sharply pointed and the other extremity either bluntly pointed or even truncated. The outer face of the hook near the blunt extremity frequently presents a jagged appearance (Text fig. 3a). The measurements of the largest and smallest hooks seen are as follows:

	Greatest breadth (diameter)	Greatest height (radius)
Large hook	32 micra	36 micra
Small hook	21 micra	17 micra

The proboscis receptacle is bulbular, measuring 375μ in length and 270μ in breadth. The brain is situated in the bulb just behind the proboscis (Text fig. 2). A number of stout muscle fibers arise at the junction of the armed and unarmed parts of the proboscis and become attached posteriorly to the anterior internal body-wall.

In the specimen examined, which was a female, the lemnisci are small, rudimentary and club-shaped. The suspensory ligaments can be traced with difficulty in whole mounts under the oil immersion; they run through the body cavity almost to the posterior extremity. About the middle of the body cavity these ligaments bear a mass of about 12 cells, densely crowded together, these being the rudiments of the female genitalia; they are attached to the wall of the body cavity by a pair of muscles, one on each side, running almost at right angles to the length of the body cavity. In those specimens in which the proboscis was retracted the latter organ occupied the greater part of the body cavity and the mass of cells referred to above were divided into two groups one on each side.

The larva, on being swallowed by a suitable host, escapes from its cyst (if this has not already been lost) and develops directly into the adult. Infections in man are not common and the way in which infection takes place is a little obscure. The larvae, occurring as they do in the abdominal cavities of cockroaches and beetles, are not passed in the feces, and infection from this source is therefore impossible. Infection in man depends on (1) infected cockroaches or beetles being swallowed whole, or (2) pollution of food by cysts from disintegrated cockroaches or beetles.

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